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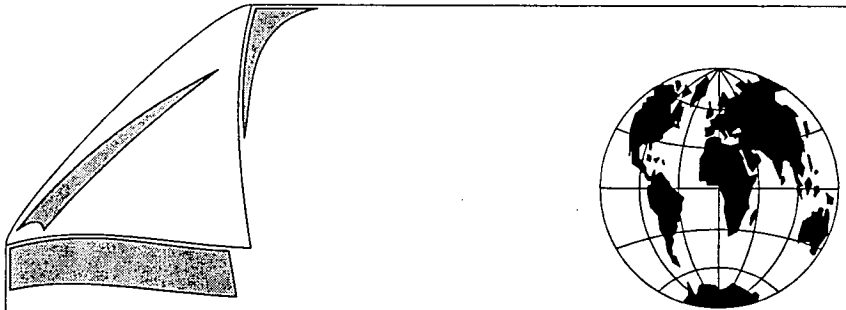

APEC AND FEEEP: AN EVOLVING INTEGRATED ASSESSMENT

by

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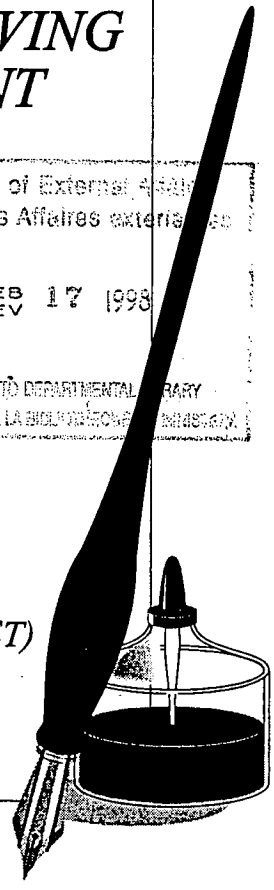

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> "Mankind's material power has now increased to a degree at which it could make the biosphere uninhabitable and will, in fact, produce this suicidal result within a foreseeable period of time if the human population of the globe does not take prompt and vigorous concerted action to check the pollution and the spoliation that are being inflicted on the biosphere by shortsighted human greed". Arnold Toynbee

A key issue agreed upon by Asia-Pacific Economic Cooperation (APEC) member Leaders has been to ensure sustainable economic prosperity in the APEC region.[1] This is a tall order. Sustainable economic prosperity is not a well defined policy objective, rather it is a synthesis of a number of policy issues and objectives. A fundamental set of issues within the synthesis is the impact of population and economic growth on the demand/supply of food and energy, and the environment. Hence, APEC's interest in FEEEP (Food, Economic Growth, Energy, Environment, Population). To increase understanding of the whole - sustainable economic prosperity - each of these FEEEP issues must be considered independently and interdependently. Moreover, each of the issues and their interdependency must be considered in national and international contexts.

The diversity of policy issues (including social equity, economic, resource usage and demographics) and the increasing recognition that there are dynamic linkages between these issues necessitates that any meaningful understanding requires a holistic approach. In one sense it is an attempt to understand the dynamic process of globalization, or perhaps more broadly how the international and domestic FEEEP

[1] Sustainable economic prosperity has been a major theme in the APEC Leaders' Declarations. In the 1993 APEC Leaders' Declaration, "APEC Leaders Economic Vision Statement", they envisioned a community of Asia-Pacific economies which inter alia would ensure "sustainable growth and provide a more secure future for our people". In the 1994 declaration, "APEC Economic Leaders Declaration of Common Resolve", the leaders sought to "attain sustainable growth and equitable development of APEC economies, while reducing economic disparities among them, and improving the economic and social well-being of our people". At the fourth annual meeting in 1996, "APEC Economic Leaders Declaration: From Vision to Action", the Leaders "affirmed our commitment to sustainable growth and equitable development".

issues cannot be considered in isolation.[2] The integrated assessment developed in this paper is a conceptual tool for undertaking such a holistic approach.

The paper first sets out a conceptual framework for addressing FEEEP. It then takes individual elements of FEEEP and attempts to identify their interlinkages. Additionally, the role of technology, which is not explicitly identified as a policy issue in the FEEEP, is highlighted. The paper concludes with some policy implications for analyzing FEEEP through an integrated assessment methodology.

An Integrated Assessment

To facilitate and simplify the understanding of FEEEP the following paragraphs set out a conceptual framework for an integrated assessment. Figure 1 is a diagrammatic presentation of the interaction[3].

The diagram has sequential components that can be viewed from left to right. These components are connected through causal, but far from completely deterministic links. Population and resource usage for example contribute to environmental stress effects. Environmental stress, which is a physical stress on the environment, turn produce social effects. Moreover, there are many feedback loops that are not shown. For example, the link between environmental stress and population, i.e., where environmental factors, such as climate change, could influence human health. Of particular significance is the manner in which social institutions and technology influence the components. Changes in technology will alter relationships in the framework; for example, new technology will influence the degree of environmental stress resulting from population or economic growth. In the FEEEP framework, technology can be embodied in its component parts, such as how new energy efficient appliances reduce per unit energy demands. Similarly, formal and informal institutions, such as the cohesion of families or the strength of local communities, or the willingness of society to accept environmental degradation will influence how environmental stress is dealt with.

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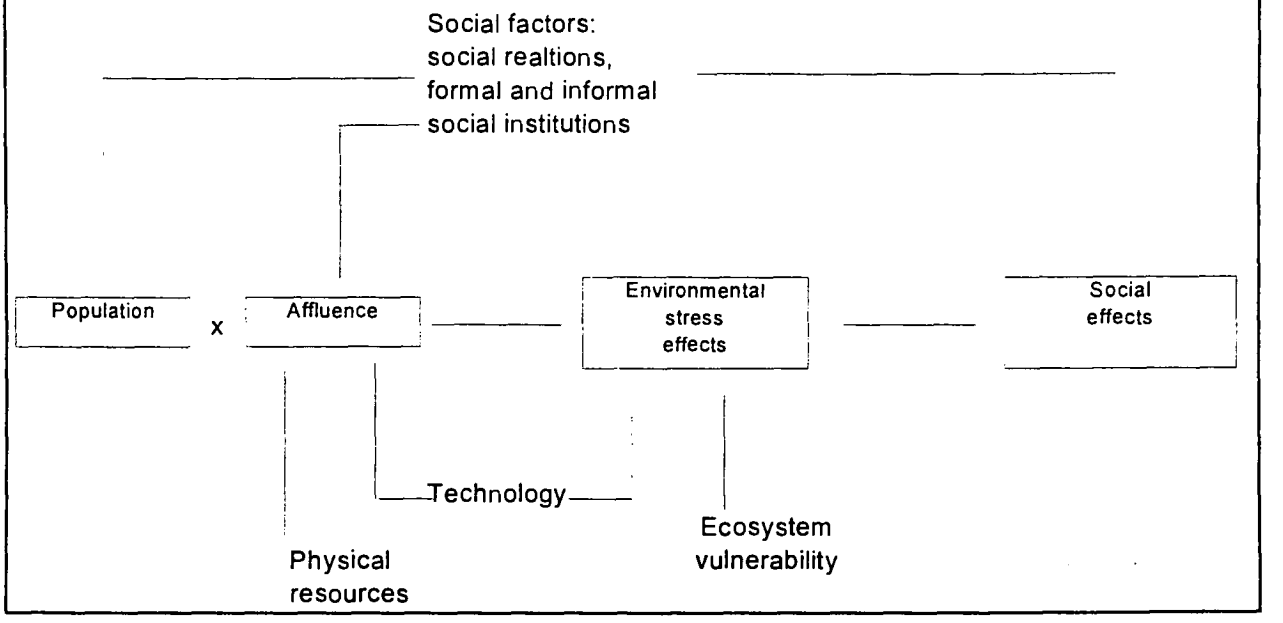
[2] In this paper globalization is understood to describe the phenomena of a growing economic interdependence of countries globally through; an increasing volume and diversity of merchandise trade and international service transactions, less restricted flows of capital, and the widespread and rapid diffusion of technology that contribute to the development of knowledge-based economies.

[3] For a country case study using an integrated assessment methodology see Robert T. Stranks with Nicolino Strizzi, "China: Environmental Stress and National Security", Policy Staff Paper No.96/01, Department of Foreign Affairs and International Trade, February 1996.

Figure 1. Conceptual Framework: FEEEP (Integrated Assessment)



Environmental stress effects are physical in nature and environmental degradation (global, national, and local) are manifestations of the effects. Environmental effects could include scarcity of resources more generally, that is where a resource is depleted (the running down of oil stocks) as opposed to degradation of renewable resources. The two major variables influencing the environmental effect are total population and per capita environmental stress. Per capita environmental stress in turn is dependent upon affluence, a per capita variable that implicitly takes into account the use of physical resources, and the technology used in the production process. "Affluence" identifies the fact that the average citizen of a developed country and the average citizen of a developing country do not have the same level of resource consumption, and thus do not inflict the same level of environmental stress. A third variable influencing the environmental effect is the vulnerability of the ecosystem to human activity. Social factors, such as preferences for types of food - meat versus cereals - also influence the affluence variable.

The box labelled Social Effects refers to the social effects that arise from or are exacerbated by environmental stress. Two key potential social effects of environmental stress are population displacement - both internal migrants and emigrants to other countries - and economic decline. For example, land degradation

caused by inappropriate irrigation (the environmental stress) could contribute to population migration (the social effect). Economic decline, contributed to by inappropriate or unsustainable development strategies, in turn may be accompanied by several social ills such as unemployment and having large numbers of people at living in relative poverty. An important aspect and influence on the social effects is social responses. This is where proactive or reactive responses, such as educational opportunities or social safety nets, are undertaken to address problems arising from environmental, population, technological or economic change. The conceptual challenge with beginning to understand FEEEP is that nearly all variables influence each other, often in complex and uncertain ways. Annex 2 provides a list of illustrative FEEEP indicators.

APEC and FEEEP

While there are major uncertainties, there are also some stylized facts. With the global population and economic output reaching new levels there has been a greater use, often exploitative in nature, of energy, food, and the physical environment. Pollution, environmental degradation and resource usage rates and levels bring into question the livelihood of achieving sustainable growth in the long run. Globally this has generated a public and political concern, as witnessed by the 1992 United Nations Conference on Environment and Development (UNCED) and more recently its 5 year review in 1997. It is widely recognized that concerted action is required if sustainability is to be achieved. Yet political commitment to action, and a consensual understanding of what specific actions are required remain elusive. In fulfilling its vision of promoting a cooperative approach to sustainable economic prosperity, APEC has established a number of bodies to explore the challenges of FEEEP in respect to the APEC members. An overview report of FEEEP is to be prepared for the APEC Leaders meeting in Vancouver in November, 1997.

Population

Population levels, geographic and age distribution, and growth rates fundamentally influence food, energy, economic considerations and the environment. It is also true, that the environment, food, energy and economic considerations influence demographics and the current or future health of populations.[4]

[4] For example, in terms of economic growth, population provides supply as labour and demand as consumers. Access to health services, such as family planning, and adequate sanitation, also influence population growth rates and health. Broader environmental conditions, such as climatic conditions, climate change and ozone depletion, are examples of other influencing factors. These

Yet while there is a general relationship between population and other FEEEP components, precisely how a given population or changes in a population influence the environment, for example, is case-specific and dependent upon many variables.[5] Technology will play a key role, both in the creation of environmental concerns, such as the increasing use of motor vehicles and emissions from their use, and in the technologies developed and deployed to reduce environmental stress, such as waste management or emission controls. In light of this, the further in the future population and demographic projections are made, such as forecasts of global figures for the years 2100 and 2150, the more difficult it becomes to understand FEEEP interactions and linkages, and the crystal ball progressively fades. The potential impact of a future population becomes more uncertain as more assumptions on possible new technologies are made. This is a critical point, as differences in view of neo-Malthusian "catastrophists" and prophets preaching of a coming gaia are often derived from differences in technological innovation assumptions.

In addition to total population or growth of population, the distribution of population is an important factor in FEEEP analysis. A prominent feature of future projected population growth is increased levels of urbanization and the continuing growth of "megacities". Population growth rates, and the rise in relative percentages of urban dwellers will place increasing pressure on the economic infrastructure. In the APEC economies' much of the urban growth will be in the developing Asian economies where urban population is projected to significantly in the early part of the next century. Rapid urban population growth could exacerbate urban pollution problems, as well as contributing to social tensions. In countries with less-well developed safety nets and a large degree of polarization in incomes, political and social stability could

socio-economic and environmental feedback loops will substantially affect demographic trends.

[5] Specifying a future population has its own problems. Depending on assumptions made, such as contraceptive use and the average age of marriage, a wide range of potential populations may be generated for any future date. The mid 1997 world population is estimated to be 5.9 billion. Whether the current global population will triple or quadruple, before it levels out, is a matter of speculation. The 1994 U.N. population projections for the year 2025 range from a low of 7.6 billion to a high of 9.0 billion. Source: The United Nations, The Sex and Age Distribution of the World Populations, The 1994 Revision, New York, 1994. An earlier publication, The United Nations, World Population Prospects, The 1992 Revision, New York, 1993, had global population estimates for 2025 ranging from 7.8 billion to 9.1 billion.

erode. All of this makes the nature of urban growth and the public policy responses to growth pressures a core element of the FEEEP.[6]

Economic Growth

Over the last decades the APEC region has experienced impressive levels of economic growth. The East Asian developing countries in particular grew at exceptionally high rates, as resources, human and physical capital, and modern technology were utilized. Yet economic growth may be "extensive" or "intensive" in nature. Extensive growth uses more productive factors to generate overall growth, but with little improvement in productivity. If growth is to be sustainable it requires that economies be structured to promote intensive growth that enhances productivity and the efficient use of resources. Thus, sustainable growth in APEC depends upon economies ability to sustain intensive growth.[7]

In order to generate intensive growth innovation and invention are required. Innovation includes improvements in human capital, through education and training, as well as physical capital. Invention and the replacement of existing capital stock are significant to FEEEP as the rate of capital formation and the average age of capital stock effects energy efficiency and environmental degradation. Intricately related to productivity improvements are trade, which allows for specialization and economy of scale, and technological change, including institutional changes that facilitate the global use of the most efficient technology.

The role of trade within FEEEP, particularly in respect to the environment, needs to be clarified. Trade while having the potential to have a negative environmental impact, does not in itself imply that trade or trade liberalization should be avoided.[8]

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[6] With increasing percentages of people in urban areas most economic growth is likely to take place in such areas.

[7] Differences in countries' per capita GDP are a crude indicator of relative levels of resource consumption. Other indicators could be per capita energy consumption or daily calorie supply per capita. The relationship between per capita consumption of resources and environmental degradation are not simple. The level of technology used in the production and consumption processes, for example, influence the level of environmental degradation.

[8] "Trade is rarely the cause of environmental degradation, although there are circumstances where it may draw attention to an existing environmental problem. Rather, the root cause of environmental degradation lies in the failure of markets fully to reflect environmental costs, often

Rather, it implies that the appropriate environmental policy, to internalize environmental costs, is required to avoid negative environmental impacts. This is also true for investment, which will determine where production takes place. With respect to reducing environmental degradation, the maintenance of an open international trading system and investment climate is beneficial. Some general conclusions:

- economic prosperity is one of the most important determinants leading to a more sustainable environment;

- promoting economic development in developing countries through trade and investment is one of the most efficient ways to raise environmental conditions on a global basis;

- trade-restricting measures are often the least efficient way of ensuring that prices reflect environmental costs and thus rarely achieve environmental goals and may even retard them;

- achieving environmental objectives by means of trade measures lends itself to protectionist abuse; and

- there is no fundamental conflict between environmental objectives and the goals and provisions of the GATT-based trade relations system, although there is room for clarification to remove any ambiguities and to strengthen the basis upon which the trade and environment issues can be made more overtly complementary.[9]

Food

Food has the supremely important characteristic that it is required to sustain life. It is a basic determinant of human welfare and well-being. Food production and

due to inadequate or inappropriate government policies or consumer information. Consequently, the most effective solution lies in implementing measures that will allow markets to reflect these costs more accurately and thus influence the behaviour of producers and consumers away from environmentally hostile decisions". Michael Hart and Sushma Gera, "Trade and the Environment: Dialogue of the Deaf or Scope for Cooperation?" Policy Staff Paper No. 92/11, Department of Foreign Affairs and International Trade, p. 15.

[9] Michael Hart and Sushma Gera, "Trade and the Environment: Dialogue of the Deaf or Scope for Cooperation?" Policy Staff Paper No. 92/11, Department of Foreign Affairs and International Trade, p. 9.

distribution, is of course, an important economic activity. The more than doubling of the world's population in the twentieth century has been accommodated through what has been termed a "green revolution". This has been made possible through the use of new technologies, widespread irrigation, greater use of fertilizers and pesticides, and an unsustainable rise in global fish catch.

Populations must be fed and growing populations translate into increased food consumption. Significant population growth implies a substantial increase in food consumption, this is a quantitative factor stemming from an absolute increase in population. There is also a qualitative factor associated with food . This factor adjusts food consumption on the basis of income. As income increases food tastes change, for example at higher incomes many people consume larger amounts of meats. This in turn has implications for the entire food chain. Taken together, increased population and increased income, have significant implications for food demand. Moreover, distributional and social questions arise, as large incomes differences translate into purchasing power, or lack of power, for food.

Aside from population and economic growth factors, environmental and technological factors must be taken into account. How can growing food requirements (quantitative and qualitative) be met through improvement in agricultural efficiency? Similarly, what are the long-term environmental implications of agricultural practices? The long-term implications refer not only to direct environmental concerns such intensive use of fertilizers and pesticide use on soil, but also global commons issues such as climate change. These are all questions to which there are no uncontested answers, but to which some hypothesis must be attached to develop links within the integrated FEEEP framework.

Trade and trade liberalization contribute to food security. With trade, food security and food self-sufficiency are not synonymous. Declines in food self-sufficiency may be met by imports from foreign producers. International trading rules, including multilateral and regional trading arrangements, that enshrine rights and obligations upon parties to the arrangement add predictability to a country's commercial transactions. Liberalized trade rules, whether in a bilateral, regional or multilateral context, which establish a secure and predictable trading system should reduce countries' desire to interpret "food security" as essentially a country's domestic ability to meet some degree of food self-sufficiency. Seeking such self-sufficiency may well have high economic and environmental costs. With liberalized trade rules, countries have access to global markets as well as sources of supply, and this should reduce any need to bring resources physically under national control.

Energy

A country's energy infrastructure is an integral part of its overall economic infrastructure, energy is also vital input for sustaining an economy as well as contributing to economic growth. Without major structural changes to an economy, economic growth implies that more energy is required or that energy is used with increased efficiency. This means that in the short run the demand for energy is to a large extent dependent upon the energy efficiency of the stock of capital. Consequently, countries seeking rapid economic growth will have a significant impact on their energy demands. In the long-run technological development and changes in the capital stock may lead to increases in energy efficiency. So there are key linkages between economic growth, energy and technology.[10]

Energy is also linked with the environment. The production and consumption of energy has negative spillovers, including over national borders, in the form of pollution and placing stress on ecological systems. Most importantly, energy emissions by increasing the concentration of gases, principally carbon dioxide, in the atmosphere contribute to climate change.[11] The warming of the earth's surface is expected to give rise to changes in climatic conditions, and this could have negative consequences, such as altering food production patterns and raising the sea level.

Environmental quality is therefore directly related to energy production and consumption patterns. A number of factors specific to each APEC economy, such as population growth, rapid industrialization, urbanization and higher per capita incomes will ensure domestic energy demand will grow. The composition of existing and expected supply of energy have significant implications for the environment. Economic growth based on hydrocarbons implies continued emission of carbon dioxide. At present, a number of APEC countries do not have a great deal of scope for fuel

[10] Some variables influencing the linkages between energy and the elements of FEEEP are: the evolving structural change of economies (for example, from manufacturing to service industries); the rate of efficiency gains (for example, in the conversion to electricity and the reduction of transmission losses in moving energy through energy grids); the degree of substitution among alternative fuels, including implications for changes in economic infrastructure, and the trade-off this has for environmental conditions (for example, coal and natural gas); and the scope to expand sustainable sources such solar power.

[11] An example of international initiative to address global commons problems is the United Nations Framework Convention on Climate Change. Article 2, sets out the Conventions objective to "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". It is proving difficult in practice to meet this objective.

diversification. Substitution of coal with less polluting fuels, such as natural gas, is not an economically viable option on a large scale. Hydroelectric and nuclear power have potential promise, but their development requires large amounts of capital and long construction periods, and they are not without their own environmental considerations.

Environment

Comprehension of FEEEP is complicated by the multiple definitions associated with the word "environment". Environment is sometimes identified with environmental stress or environmental degradation. Other times it is associated with either renewable or non-renewable resource scarcity. In terms of contributing to economic growth, the environment is both an input (physical restraints on growth or the type of growth) and an output (economic growth's affect on the environment). For each linkage in the FEEEP there is a need to clarify how the "environment" is being interpreted in a specific analysis.

Major concerns have been expressed in respect to the environmental degradation resulting from economic activities and increasing populations. As noted above, energy production and consumption have major environmental implications. While interrelated, environmental degradation pressures may be categorized into pollution oriented or ecologically oriented. Pollution is a significant and widespread environmental threat. In a number of APEC countries, advancing urbanization, rapid industrialization, use of outdated technologies and low sanitation practices have resulted in serious air, land and water pollution. Industrial and domestic solid waste disposal and hazardous and toxic wastes pose constant challenges. In rural areas, fertilizer use contributes to low water quality through the leaching of nitrates into groundwater and runoff into streams.

Aside from pollution problems, countries face ecological problems. Demand for food and agricultural practices have created a number of environmental problems. Excessive use of irrigation, misuse of fertilizers, over-intensified use of marginal lands and inappropriate use of pesticides have all played a contributing role. Degradation and deterioration of forests has been widely documented, although there is still debate over the precise extent of the abuse (such as new growth forests having lower phytomass or supporting less biodiversity). Grasslands' through overgrazing and improper use for grain production, has been a significant cause of desertification and soil erosion. Annex 1 summarizes the major causes and consequences of environmental stress on natural ecosystems.

Technology and the Knowledge-based Economy/Society

A key variable for FEEEP is innovation and invention. The rate of technological progress and the dissemination of innovation profoundly influence such FEEEP components as economic growth and the environmental context within which such growth occurs. Innovation and invention are influenced by both domestic and international factors. For example, cross-national technology transfer, trade related intellectual property rights, and foreign investment regimes all influence the rate of technological change.

The knowledge-based economy/society is characterized by three interrelated phenomena: the global reach of information and computer communications systems; knowledge-based economic growth where comparative advantage is derived from the capability to create, acquire, accumulate and exploit knowledge; and, the social changes associated with technology and knowledge-based growth and economies. A major component and agent of change in the global economy including the APEC region is Information Technology.

Information technologies' has significant benefits, notably its effects on economic growth and stimulation of competition. The so-called "Asian Miracle" and the current dynamic role the Asian countries play in the global economy is firmly rooted in private and public sector promotion and use of information technology. Globally, governments are also well aware that their own efficiency and delivery of services maybe enhanced through use of new information technologies.

Outside of a national or a regional context, the APEC members have been supportive of a predictable and open trading environment which promotes competition and innovation. In this regard APEC initiatives toward trade liberalization and reducing protectionism contribute to fully realizing the benefits of new technologies and the global movement toward increasingly knowledge-based economies.[12]

[12] A major development was the WTO agreement to eliminate information products tariffs which was finalized on March 26. The value of this sector, which includes computers, software, and semiconductors equipment, is estimated at over $500 billion (U.S.). Together, the Information Technology Agreement and the Agreement on Basic Telecommunications Services liberalize approximately $1 trillion (U.S.) in trade in goods and services.

Policy Implications

The two fundamental parameters of FEEEP are that the world is organized politically into states; and that these same states are becoming increasingly interdependent. Interdependence is most readily seen in terms of increasing economic integration and management challenges of the global commons. The concepts of national security and human security are no longer confined to national political sovereignty. Nationally and internationally, there is a need for governments to take a more systematic approach to addressing FEEEP linkages.

The FEEEP linkages suggest that all governments will need to reassess domestic and international policy approaches that address FEEEP issues. Efforts to date on generating global cooperation on environmental issues and reducing environmental stress in general have had mixed success. UNCED cannot claim much success in terms of concrete results, although it was a start and raised awareness of pressing issues.[13] The comprehensive program for action - Agenda 21 - agreed to by governments at UNCED, lacks the force of law and the implementation of Agenda 21 is dependent upon best endeavours and not contractual obligations. As the world has seen since 1992, the political rhetoric has not become translated into effective programs. There remains ample scope for countries unilaterally or collectively to make firm commitments for pursuing sustainable development.

Financial assistance remains a powerful instrument for promoting environmental stewardship or improving social conditions. Such assistance could consist of aid, but might also involve debt forgiveness. For the greatest impact, aid would need to provide new and additional resources. This was agreed to in principle at UNCED, but has proven to be politically difficult for the developed countries. Yet, there are good

[13] "The sad fact is that governments did not commit themselves, individually or collectively, to implement any concrete measures to reduce catastrophic rates of population growth, or to alter certain consumption patterns, say in fossil fuels. Nor did governments agree on any measures to roll back mass poverty, reduce the debt of poor countries - some voluntary announcements were made, but no collective agreement to increase poor-country access to rich country markets. There is nothing in the conventions on climate change and biodiversity that binds governments to concrete measures, with targets and timetables, to reduce emissions of carbon dioxide and other greenhouse gases or to reduce high rates of deforestation or species loss ... So, the sad bottom line is that governments did not agree to implement any measures that would alter the dismal trends that brought them to Rio ... Our leaders left almost nothing unsaid and almost everything undone". Jim MacNeil, the former Secretary General of the Brundtland Commission, statement before the Canadian Parliament's Standing Committee on the Environment. Quoted in Thomas Homer-Dixon, "Environmental and Demographic Threats to Canadian Security", Canadian Foreign Policy, Vol. 2, No.2, Fall 1994, pp. 27-8.

reasons for seriously considering further aid reorientation. Developed country reductions in emissions of greenhouse gases could be more than offset by increases in emissions by developing countries. This would not bode well for the objective of reducing climate change. Awareness of FEEEP linkages may, and should, also give a shot of adrenalin to countries experiencing "donor fatigue". Taxpayers in the developed countries are more likely to support development assistance if they can draw an intellectual linkage between the assistance and their own private interest and well-being.

But international action is more than "carrots" and "sticks" applied by the developed countries. The developed countries will need to encourage their citizens to change their lifestyle. The developed countries, with their high rate of per capita consumption, contribute to environmental degradation. In the long term, the developed countries are also not immune to population pressures and more general resource scarcity. Secondly, the developed country's environmental effects, such as their contribution to climate change, have a spillover impact on the developing countries. Thus, in part, the environmental stress in the developing countries is a result of activities in the developed countries.

International cooperation on FEEEP linkages will likely be hindered by uncertainties and divergent views surrounding the nature of the problems and their potential solutions.[14] As noted in the first paragraph of the paper sustainable economic prosperity, while favoured by all, is not a well defined policy objective. Until there is a convergence of views on the various aspects of FEEEP, it is not likely that adequate collaborative measures and responses will be undertaken.

A practical first step to increasing our understanding of FEEEP and developing a common understanding of the dynamic process at work, might be economy-specific case studies of the APEC members. Such an approach would essentially attempt to take each of the APEC economies through the conceptual framework presented in the paper. This would, for example, involve identifying population and "affluence" pressures, and the level and type of environmental degradation being placed upon the country. This horizontal country approach would complement the sectoral approach of the APEC Economic Committee's various groups and the work being conducted in other APEC fora. It would also require explicitly accounting for technological and social factors. With such case studies in hand, a symposium bringing together the

[14] For example, while an extremely sensitive political issue, population planning assistance could be reviewed. The dynamics of FEEEP are such that there can be no "holy cows", all controversial issues no matter how politically sensitive, require critical dialogue stimulating timely action.

economy specific findings with an eye to identifying APEC regional trends could serve as a catalyst for developing a consensual understanding of the process.

Secondly, and linked to the this first initiative, is that APEC could work toward building an inventory of 'best practices' across the component parts of FEEEP. The development of a user friendly inventory could also allow the existing APEC working groups to more broadly and easily take into account FEEEP issues. For example, the Economic Committee`s Task Force on Food could more easily take into account rural development programs not explicitly concerned with food production, but nevertheless programs that influence farm populations decision-making, such as non-agricultural employment opportunities.

Most importantly, there appears to be an opportunity for APEC to take a leadership role on FEEEP and the integrated assessment approach required. In many respects APEC is uniquely structured to effectively undertake this challenging task. APEC has the organizational flexibility to simultaneously develop analytical capacity in the component parts of FEEEP as well as the cross-component linkages. APEC also has the potential to co-ordinate and draw upon the analytical work of a range of expert organizations that individually lack the mandate to fully address FEEEP.

Annex: 2

FEEEP Illustrative Indicators --- Developing Countries

	Brunei Darussalam	Indonesia	Republic of Korea	Malaysia	Philippines	Singapore
Food Security						
Food production per capita index, (1979-81 = 100) 1993	100	19	94	203	88	47
Food consumption as % of total household production 1980-1985	N/A	48	35	23a	51	N/A
Employment						
Labour force as % of total population, 1990	41	44	46	39	40	49
% of labour force in agriculture 1960,1990	34,2	75,55	61,18	63,27	64,46	7,0
% of labour force in industry 1960,1990	35,24	8,14	10,35	12,23	14,15	23,36
% of labour force in services 1960,1990	31,74	18,31	28,47	25,50	22,39	70,64
Real earnings per employee annual growth rate, 1980-92	N/A	4.3	8.4	0.4	5.2	5.1
Demographic Profile						
Estimated population, (millions), 1960,1993,2000	0.1,0.3,0.3	96.2,191.7,212.7	25.0,44.1,47.1	8.1,19.2,22.3	27.6,64.8,74.6	1.6,2.8,3.0
Annual population growth rate, (%), 1960-93,1993-2000	3.7,1.9	2.1,1.5	1.7,0.9	2.6,2.1	2.6,2.0	1.6,0.9
Natural resource balance sheet						
Land area (1000 ha) 1993	577	190,457	9,902	32,975	30,000	62
Forest and woodland (as % of land area) 1993	78.0	58.7	85.2	67.6	45.3	4.8
Arable land (as % of land area) 1993	0.5	9.9	19.0	3.2	18.4	1.6
Irrigated land (as % of arable area) 1993	33.3	24.3	71.1	32.7	28.6	N/A
Deforestation (1000 ha per year) 1980-89	N/A	920	N/A	310	143	N/A
Annual rate of deforestation (%) 1980-89	N/A	0.8	N/A	1.5	1.5	N/A
Reforestation (1000 ha per year) 1980-89	40	131	67	20	50	N/A
Internal renewable water resource per capita (1000 m3 per year) 1992	21.0	13.2	1.5	24.3	5.0	0.2
Fresh water withdrawals as % of water resources 1980-89	3	1	17	2	9	32
Fresh water withdrawals per capita (m3) 1980-89	1,042	95	299	768	693	84
Energy Consumption						
Commercial energy production average annual growth rate (%) 1971-80,1980-93	N/A	8,4	5,8	19,12	31,6	N/A,N/A
Commercial energy consumption average annual growth rate (%) 1971-80,1980-93	N/A	13,8	11,10	8,10	5,4	8,8
Commercial energy use per capita (kilograms per capita) 1971,1993	N/A	71,321	507,2863	436,1529	222,328	1396,5583
Commercial energy use, GDP output per kilogram (US$) 1971,1993	N/A	1.4,5.4	0.8,2.6	0.9,2.2	0.9,2.5	0.8,3.8
National income accounts						
GDP (US$ billions) 1993	N/A	144.7	330.8	64.4	54.1	55.2
Agriculture (as % of GDP) 1993	N/A	19	7	N/A	22	(..)
Industry (as % of GDP) 1993	N/A	39	43	N/A	33	37
Services (as % of GDP) 1993	N/A	42	50	N/A	45	63
Exports (as % of GDP) 1993	N/A	23.2	24.9	73.1	20.5	134.2
Imports (as % of GDP) 1993	N/A	19.4	25.3	70.8	34.7	154.5
Trends in economic performance						
GNP annual growth rate (%) 1980-93	N/A	6.0	8.7	6.4	1.7	7.6
GNP per capita annual growth rate (%) 1965-80,1980-93	N/A	5.2,4.2	7.3,8.2	4.7,3.5	3.2,-0.6	8.3,6.1
Average annual rate of inflation (%) 1980-93,1993	-5.1,N/A	8.5,19.3	8.3,4.8	2.2,1.6	13.8,6.8	2.5,4.0
Exports as % of GDP, annual growth rate (% annual growth rate) 1980-93	N/A	-1.9	2.3	4.2	2.5	2.9

SOURCE: Human Development Report 1996
a data refers to a year or period other than that specified in the column heading
b includes beverages and tobacco
(.) less than half the unit shown
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*Human Development Report did not provide data for Chinese Taipei

Annex: 1

Natural Ecosystems: Summary of Major Causes and Consequences of Ecosystem Change

Natural Ecosystem	Causes	Consequences
Forests	• Increasing population • Conversion to farmland • Conversion to higher yield monoculture • Excessive felling • Low success rate of reforestation	• Flooding, siltation of rivers • Loss of biodiversity • Long-term shortages of forest products • Soil erosion
Grasslands/Steppe	• Conversion to farmland • Overgrazing • Increasing population • Poor use of water resources	• Desertification • Loss of biodiversity • Increase in soil erosion, siltation • Increase in floods and droughts • Salinization
Rivers/Lakes	• Untreated urban industrial effluent • Increase in agricultural runoff • Untreated disposal of domestic waste water • Dam construction	• Pollution of fresh water supply • Health hazard • Decreasing aquatic resources • Siltation
Coastal Wetlands/ Marshlands	• Often seen as "wastelands" • Reclamation for agricultural use • Drainage for disease control • Conversion to fish ponds • Drained and filled for industrial use or urban sprawl • Pollution from industry or agricultural runoff	• Decreasing wetlands area • Siltation • Increased flooding • Decreased water quality • Loss of biodiversity and wildlife resources

Source: Editorial Board, China Conversation Strategy, Boulder: Lynne Reimer Publishers, 1994 and the World Bank, "China Environmental Strategy Paper," Report No. 9669-CHA, 1992.

Annex: 2

FEEEP Illustrative Indicators --- Developing Countries Continued

	Thailand	China	Hong Kong	Mexico	Papua New Guinea	Chile
Food Security						
Food production per capita index, (1979-81 = 100) 1993	102	145	87	94	103	118
Food consumption as % of total household production 1980-1985	30	61ab	N/A	35ab	N/A	29
Employment						
Labour force as % of total population, 1990	57	59	51	37	49	38
% of labour force in agriculture 1960,1990	94,64	83,72	8,1	55,28	90,79	30,19
% of labour force in industry 1960,1990	4,14	6,15	52,37	19,24	4,7	30,25
% of labour force in services 1960,1990	12,22	10,13	41,62	25,48	6,14	39,56
Real earnings per employee annual growth rate, 1980-92	N/A	N/A	4.8	N/A	N/A	-0.3
Demographic Profile						
Estimated population, (millions), 1960,1993,2000	26.4,57.6,61.9	657.5,1196.4,1284.6	3.1,5.8,6.0	36.9,90.0,102.4	1.9,4.1,4.8	7.6,13.8,15.3
Annual population growth rate, (%), 1960-93,1993-2000	2.4,1.0	1.8,1.0	1.9,0.4	2.7,1.9	2.3,2.3	1.8,1.5
Natural resource balance sheet						
Land area (1000 ha) 1993	51,312	956,100	104	195,820	46,824	75,695
Forest and woodland (as % of land area) 1993	26.3	13.5	21.2	24.9	90.7	21.8
Arable land (as % of land area) 1993	34.3	9.6	5.8	11.8	0.1	5.3
Irrigated land (as % of arable area) 1993	25.0	53.6	33.3	26.3	N/A	31.8
Deforestation (1000 ha per year) 1980-80	397	N/A	N/A	615	23	5
Annual rate of deforestation (%) 1980-89	2.5	N/A	N/A	1.3	0.1	0.7
Reforestation (1000 ha per year) 1980-89	24	4,552	N/A	22	2	74
Internal renewable water resource per capita (1000 m3 per year) 1992	2.0	2.4	N/A	4.1	197.5	34.4
Fresh water withdrawals as % of water resources 1980-89	18	16	N/A	15	(.)	4
Fresh water withdrawals per capita (m3) 1980-89	600	462	N/A	875	28	1,623
Energy Consumption						
Commercial energy production average annual growth rate (%) 1971-80,1980-93	10,26	8.5	N/A,N/A	17,2	12,20	0,2
Commercial energy consumption average annual growth rate (%) 1971-80,1980-93	7,11	7,5	7,7	10,3	7,2	1,5
Commercial energy use per capita (kilograms per capita) 1971,1993	176,678	278,623	850,2278	653,1439	136,238	709,911
Commercial energy use, GDP output per kilogram (US$) 1971,1993	1.1,3.2	0.4,0.6	1.2,8.3	1.2,2.7	2.1,5.2	1.5,3.5
National income accounts						
GDP (US$ billions) 1993	124.9	425.6	90.0	343.5	5.1	43.7
Agriculture (as % of GDP) 1993	10	19	N/A	8	26	N/A
Industry (as % of GDP) 1993	39	48	21	28	43	N/A
Services (as % of GDP) 1993	51	33	79	63	31	N/A
Exports (as % of GDP) 1993	29.5	21.6	150.3	8.8	35.2	21.4
Imports (as % of GDP) 1993	36.9	24.2	154.1	14.6	25.5	24.3
Trends in economic performance						
GNP annual growth rate (%) 1980-93	7.9	9.6	N/A	1.9	3.7	4.6
GNP per capita annual growth rate (%) 1965-80,1980-93	4.4,6.4	4.1,8.2	6.2,5.4	3.6,0.5	0.6,0.6	(.),3.6
Average annual rate of inflation (%) 1980-93,1993	4.3,3.4	7.0,12.3	7.9,8.8	8.8,9.0	4.8,3.2	20.1,12.1
Exports as % of GDP, annual growth rate (% annual growth rate) 1980-93	5.4	2.9	7.0	1.6	2.7	2.9

SOURCE: Human Development Report 1996
a data refers to a year or period other than that specified in the column heading
b includes beverages and tobacco
(.) less than half the unit shown
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Annex: 2

FEEEP Illustrative Indicators --- Industrial Countries

	Australia	Canada	Japan	New Zealand	USA
Employment					
Labour force as % of total population, 1990	50	53	52	48	50
% of labour force in agricultura 1990	6	3	7	10	3
% of labour force in industry 1990	26	25	34	25	34
% of labour force in services 1990	68	71	59	65	59
Real earnings per employee annual growth rate, 1980-92	0.5	0.1	1.9	0.1	0.4
Demographic Profile					
Estimated population, (millions), 1960,1993,2000	10.3,17.8,19.2	17.9,28.8,31.0	94.1,124.5,126.5	2.4,3.5,3.8	180.7,257.9,275.1
Annual population growth rate, (%), 1960-93,1993-2000	1.8,1.3	1.5,1.1	0.9,0.2	1.2,1.1	1.1,0.9
Natural resource balance sheet					
Land area (1000 ha) 1993	771,336	997,614	37,760	27,099	980,943
Forest and woodland (as % of land area) 1993	18.8	49.5	66.4	27.2	29.2
Arable land (as % of land area) 1993	6.0	4.6	10.7	9.0	18.9
Irrigated land (as % of arable land area) 1993	4.6	1.6	69.1	11.6	11.1
Internal renewable water resource per capita (1000 m3 per year) 1992	19.5	106.0	4.4	114.9	9.7
Fresh water withdrawals as % of water resources 1980-89	5	2	16	N/A	19
Fresh water withdrawals per capita (m3) 1980-89	1,280	1,684	733	585	1,952
Energy Consumption					
Commercial energy production average annual growth rate (%) 1971-80,1980-93	5.6	3.4	3.5	5.8	1.1
Commercial energy consumption average annual growth rate (%) 1971-80,1980-93	3.2	4.2	3.3	3.5	2.1
Commercial energy use per capita (kilograms per capita) 1971,1993	4079,5316	6233,7821	2533,3642	2434,4299	7633,7918
Commercial energy use, GDP output per kilogram (US$) 1971,1993	0.9,3.1	0.7,2.4	0.9,9.3	1.1,2.9	0.7,3.1
Environment and pollution					
Greenhouse gas emissions (thousands of tons), 1993a	286,283	459,390	1,146,360	30,220	5,128,734
Greenhouse gas emissions as share of world total, 1993a	1.3	2.1	5.3	0.1	23.5
Major protected areas (as % of national territory), 1993b	7.7	8.9	7.3	22.8	10.6
Spent fuel produced (metric tons of heavy metal), 1993	N/A	1,690	876	N/A	2,400
Hazardous waste production (1000 metric tons), 1991-94	426	7,786	N/A	110	276,000
Municipal waste generated (kg per person), 1992	890	660	410	N/A	730
Population served by municipal waste services (%), 1993a	N/A	100	100	N/A	100
Paper and cardboard recycling (as a % of apparent consumption), 1990-93	50	32	51	N/A	34
Glass recycling (as a % of apparent consumption), 1990-93	36	75	58	N/A	22
National income accounts					
GDP (US$ billions) 1993	289.4	477.5	4214.2	43.7	8259.9
Agriculture (as % of GDP) 1993	3	3	2	7	2
Industry (as % of GDP) 1993	29	32	41	26	28
Services (as % of GDP) 1993	67	64	57	67	70
Exports (as % of GDP) 1993	15	30	9	24	7
Imports (as % of GDP) 1993	15	28	6	22	10
Trends in economic performance					
GNP annual growth rate (%) 1980-93	2.7	2.2	3.6	1.8	2.4
GNP per capita annual growth rate (%) 1985-80,1980-93	2.2,1.6	3.3,1.4	5.1,3.4	1.7,0.7	1.6,1.7
Average annual rate of inflation (%) 1980-93,1993	6.1,1.1	3.9,1.2	1.5,0.8	8.5,0.9	3.6,2.0
Exports as % of GDP, annual growth rate (% annual growth rate) 1980-93	3.9	3.2	1.6	2.3	2.8

SOURCE: Human Davelopment Report 1996
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